Make each homogeneous set of terms equal to a summand of the absolute term. Operate on these by $\mathrm{A}-D$, and add the results.

Example. $xy+x+y=a$. $\quad xy=p,\quad x_1y+xy_1=2p$

$x+y=q,\quad x+x_1+y+y_1=2q$

Whence $x_1y+xy_1+x+y+x_1+y_1=2x_1y_1+2x_1+2y_1$, and $x_1y+xy_1+x+y-x_1y_1=a$.

Example. $xy+x=1$. $\quad xy=p,\quad xy_1+x_1y=2p$

$x=q,\quad x+x_1=2q$

Whence $x_1y+xy_1+x+x_1=2(p+q)=2$.

Example. $x^2+y^2+xy=1$. $\quad x^2+y^2=p,\quad 2(xx_1+yy_1)=2p$

$xy=q,\quad xy_1+x_1y=2q$

Whence $xy_1+x_1y+2xx_1+2yy_1=2$.

Example. $x^2+xy=a$. $\quad x^2=p,\quad 2xx_1=2p$

$xy=q,\quad xy_1+x_1y=2q$

Whence $x_1y+xy_1+2xx_1=2a$.

PROOF THAT FOR MAXIMUM CURRENT THE EXTERNAL AND INTERNAL RESISTANCES SHOULD BE EQUAL.

By JAMES S. STEVENS, Professor of Physics, University of Maine, Orono, Me.

If we have a cells to connect we may take m series with n cells in each series. Then $mn=a$.

By formula for Ohm's law,

$$C=\frac{nE}{\frac{nr}{m}+R}$$

where r and R are respectively the internal resistance of each cell and the total external resistance.

Dividing numerator and denominator by n we have

$$C=\frac{E}{\frac{r}{m}+\frac{R}{n}}.$$

For maximum current it is necessary to make $\frac{r}{m}+\frac{R}{n}$ a minimum.

The expression takes the following form :

$$\frac{R}{n}+\frac{r}{a/n}, \quad \frac{aR+rn^2}{an}.$$

Placing the first differential coefficient of this expression equal to zero we have

$$\frac{2an^2rdn-a^2Rdn-an^2rdn}{a^2n^2}=0.$$

From which

$$rn^2=aR, \quad n^2=\frac{aR}{r}.$$

Replacing the value of a/m for one factor in n^2,

$$n\frac{a}{m}=\frac{aR}{r}, \quad \frac{n}{m}=\frac{R}{r}, \quad R=\frac{n\,r}{m}.$$

Or the external resistance equals the total internal resistance. This is seen to be a minimum value for the expression differentiated since the value of the second differential coefficient is greater than zero for the positive value of n, —the only value it can have.

THE RADIUS OF THE TERRESTRIAL SPHEROID.

By F. P. MATZ, M. Sc., Ph. D., Professor of Mathematics and Astronomy in Irving College, Mechanicsburg, Pa.

If there be nothing *new* under the sun, it may not be uninteresting to expand the *old*.

Represent the earth's equatorial radius by a, the geographical latitude by ϕ, and the geocentric latitude by ϕ'; then since $x^2/a^2+y^2/b^2=1$, we have $\tan\phi=-dx/dy$, and $\tan\phi'=y/x$. Also, since $b^2=a^2(1-e^2)$, we have

$$y^2=a^2(1-e^2)-(1-e^2)x^2 \text{ and } y/x=(1-e^2)\tan\phi.$$

$$\therefore\ x=\frac{a\cos\phi}{\surd(1-e^2\sin^2\phi)} \text{ and } y=\frac{a(1-e^2)\sin\phi}{\surd(1-e^2\sin^2\phi)}\ \ldots\ (1).$$

Now, the radius of the terrestrial spheroid for any latitude ϕ, is $\rho=\surd(x^2+y^2)$.

$$\therefore\ \rho=a\sqrt{\left(1-\frac{e^2(1-e^2)\sin^2\phi}{1-e^2\sin^2\phi}\right)},=a\surd[1-e^2(1-e^2)(\sin^2\phi+e^2\sin^4\phi)].$$

By assuming $e^2=1-f^2$ and $\sin^2\phi=\frac{1}{2}(1-\cos2\phi)$, Encke obtains the series